

STS-111
FLIGHT READINESS REVIEW

May 16, 2002

Ground Operations

<h1>AGENDA</h1>	

- Shuttle Processing

- Integrated Operations

J. Vevera

- Shuttle Engineering

C. Connolly
B. McCain

- Launch and Landing

M. Leinbach

- Summary

D. King
A. Allen
C. Murphy

PROCESSING DELTAS

Presenter:

Jim Vevera

Organization/Date:

Ground Ops/05-16-02

Processing Differences - VAB / Pad

- Planned
 - Late SSRMS Wrist Joint Installation

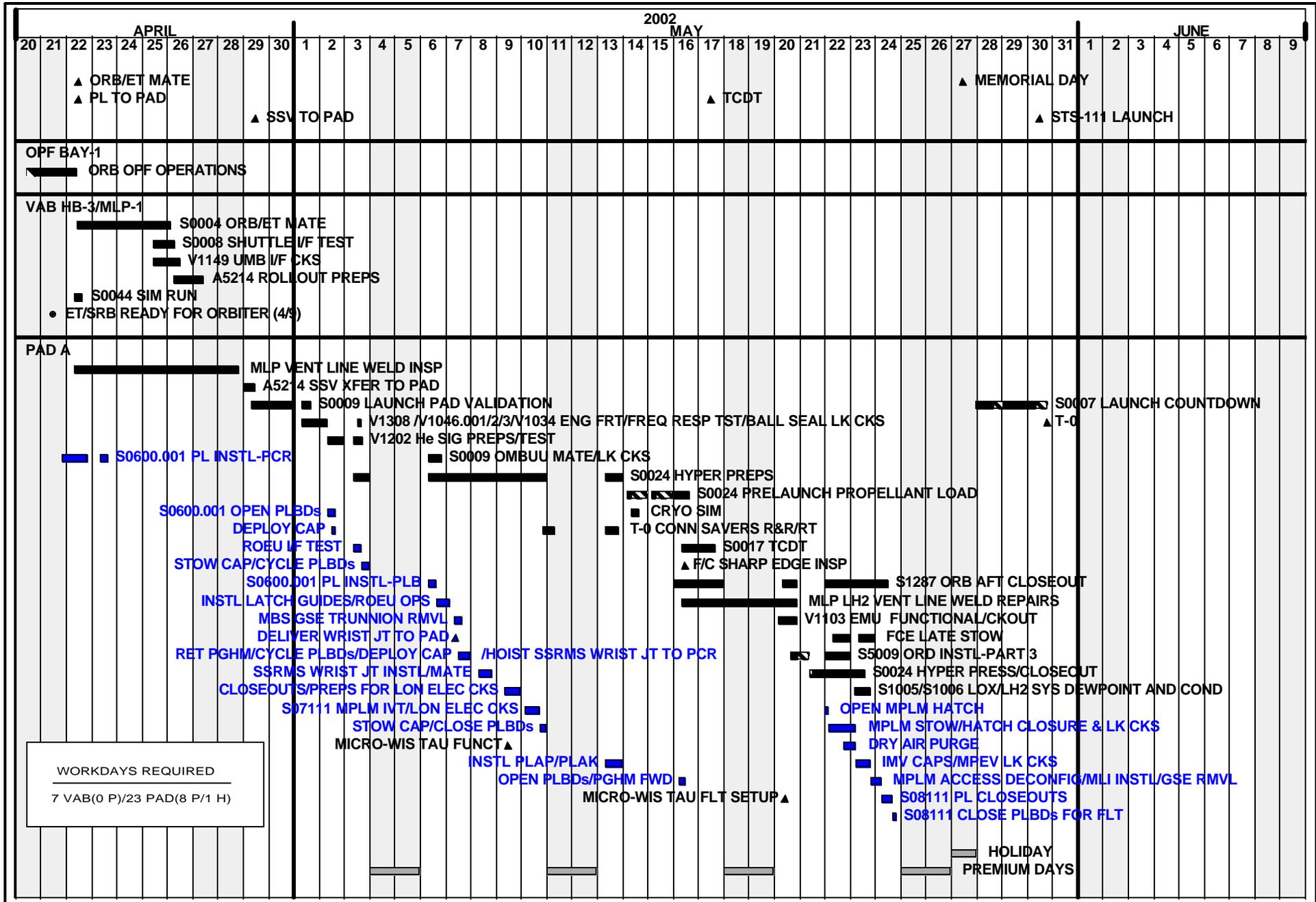
- Unplanned
 - MPS Cavity Purge 750 PSI GN2 Line R&R
 - MLP H2 Vent Line Weld Inspections
 - T-0 Connector Saver Inspection/Replacement

STS-111 / OV-105 Integrated Operations Assessment Summary

OPR: USA - J. Vevera, INT FM(1-2567)
NASA - J. Guidi, PH-A2 (1-9223)

Payload: ISS-14-UF2/MPLM1(P)-03 (C/R) (VERT)

14MAY02 07:23



SHUTTLE ENGINEERING OVERVIEW	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

The following Topics have been reviewed:

- | | |
|--|-----------------------|
| ● Requirements Status – OMRS | No Issues |
| ● TOPS Status | No Issues |
| ● LCC/GLS Status | No Issues (in backup) |
| ● Software, SCAN, and Configuration Status | No Issues |
| ● Vehicle/GSE Modification Status | No Issues |
| ● In-Flight Anomaly Status | To Be Presented |
| ● Lost Item Problem Reports | No Issues (in backup) |
| ● Time/Life Cycle | No Issues |
| ● Critical Process Changes | No Issues |
| ● Unexplained Anomalies | No Issues |
| ● Safety, Quality, and Mission Assurance | No Issues |
| ● Engineering Topic | No Issues |
| ● Nonstandard Work Summary | No Issues (in backup) |

IN-FLIGHT ANOMALIES

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02

- STS-110-K-02 Launch Data Bus (LDB) Switchover
- STS-110-K-03 Radio Frequency (RF) Front End Processor (FEP) Data Interruption
- STS-110-K-01 MLP3 Hydrogen Vent Line Failure

**IN-FLIGHT ANOMALY
STS-110 LAUNCH DATA BUS (LDB)
SWITCHOVER****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Observation
 - During STS-110 cryogenic drain operation, LDB switched from bus 1 to bus 2
 - Auto Switch back to Bus 1 was unsuccessful

- Concerns
 - Loss of Launch Data Bus redundancy
 - LCC LPS-17 requires 2 of 2 LDB's until T-9 minutes

- Possible Causes
 - Ground Support Equipment (GSE) T-0 cable
 - T-0 connector savers
 - OV-104 Aft Components

IN-FLIGHT ANOMALY STS-110 LAUNCH DATA BUS (LDB) SWITCHOVER (CONT'D)	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

- Actions Taken (STS-110)
 - Replaced suspect 120 foot cable and connector saver during scrub turnaround
 - T-0 (50J71) to MLP3 terminal distributor
 - Successfully supported STS-110 cryo load and Launch
 - Post launch evaluation of suspect T-0 120 foot cable
 - Unable to repeat initial anomaly
 - Cable passed resistance and continuity checks
 - Corrosion on connector pins was not a contributor
- Actions In-Work
 - Perform Lab evaluation of suspect cable
 - Verify no anomalies with OV-104's Data Bus Isolation Amplifier (DBIA) and associated wiring

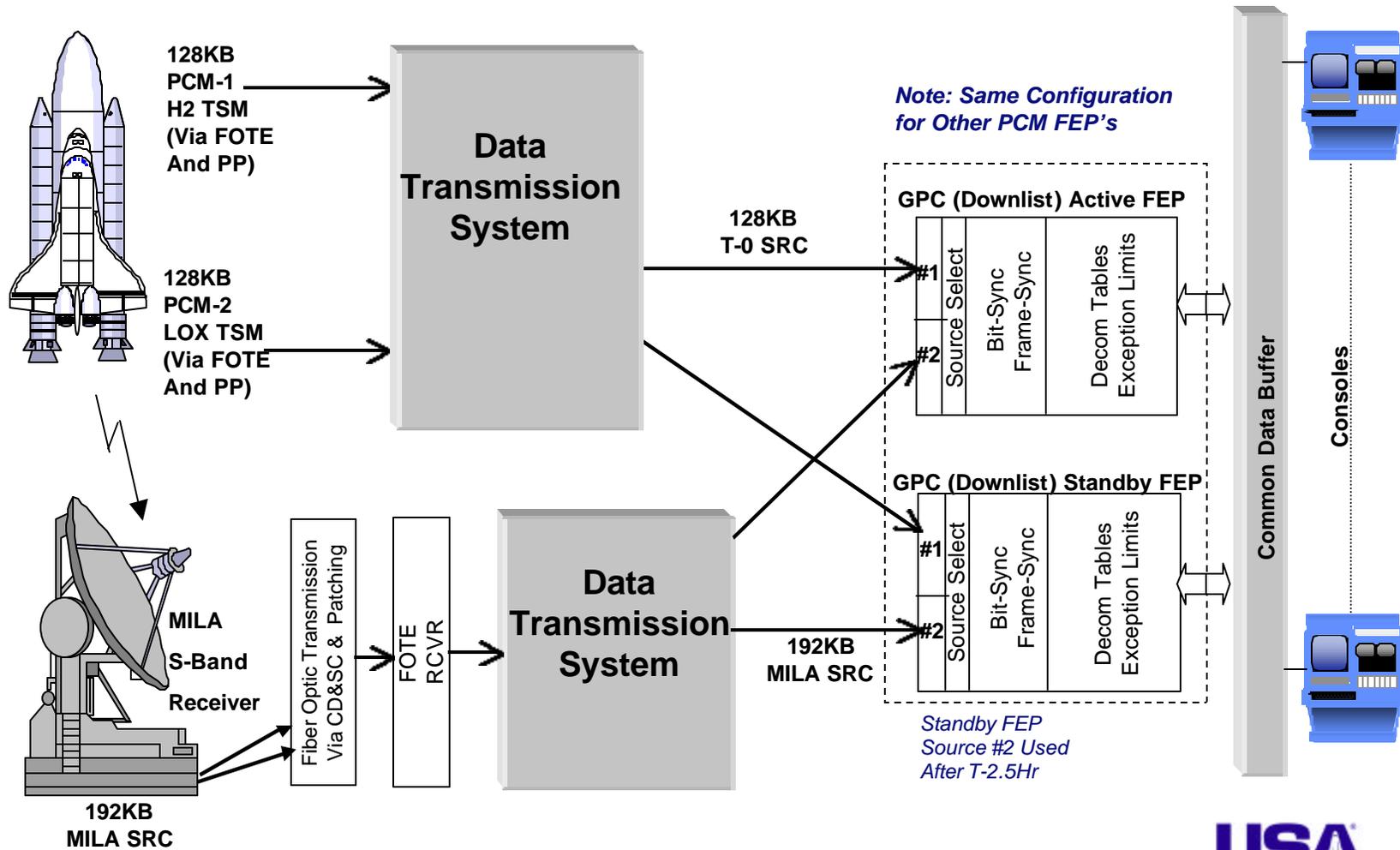
IN-FLIGHT ANOMALY STS-110 LAUNCH DATA BUS (LDB) SWITCHOVER (CONT'D)	Presenter: Chris Connolly
	Organization/Date: Ground Ops/ 05-16-02

- Launch Rationale
 - MLP1 is supporting OV-105 STS-111
 - LDB exhibits excellent wave form
 - No discrepancies noted on the T-0 GSE cable
 - All T-0 connectors savers were inspected for proper installation
- Risk Assessment
 - No Risk to Flight and Crew's safety
 - System redundancy protects against loss of function

**IN-FLIGHT ANOMALY
STS-110 RF FEP DATA
INTERRUPTION****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/ 05-16-02**

- Observation
 - RF data interruption caused 3 standby Front End Processors (FEP) (OI, GPC, and Payload) to experience synchronization errors
 - Occurred during STS-110 Launch at T-7 minutes 3 sec
 - 2 of the 3 standby FEP's placed into NOGO as result of three consecutive synchronization errors
 - Active FEP's utilize hard line
 - T-0 connection to LPS FEP's
- Concerns
 - Loss of RF FEP integrity for command and control capability

SIMPLIFIED PCM RF/HARDLINE DATA PATHS



GO-11

**IN-FLIGHT ANOMALY
STS-110 RF FEP DATA
INTERRUPTION (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/ 05-16-02**

- Discussion
 - Standby FEP's switch from Hard-line to RF at T-2 hours and 30 minutes
 - Standby FEP's synchronized with the Primary FEP's at T-45 minutes

- Actions Taken
 - S0007 Pre-planned procedure was implemented
 - Resynchronize stand-by FEP's data tables with active FEP's
 - Ground Launch sequencer (GLS) dependant on tables
 - Recovery procedure completed and full redundancy was restored to support STS-110 launch

**IN-FLIGHT ANOMALY
STS-110 RF FEP DATA
INTERRUPTION (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/ 05-16-02**

- Actions Taken (Cont'd)
 - Post Launch data evaluation
 - Sources of possible RF interference (RFI)
 - Orbiter Access Arm (OAA) retracts at T- 7 minutes 30 seconds to T-5 minutes 30 seconds
 - RF signal degrades during retract
 - Observed on both Pads
 - Media equipment
 - Atmospheric conditions
 - Unable to isolate problem
 - Most probable cause was a combination of OAA retract and atmospheric conditions
 - Security measures not a contributor to this anomaly

**IN-FLIGHT ANOMALY
STS-110 RF FEP DATA
INTERRUPTION (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/ 05-16-02**

- Actions Planned
 - Enhance LPS Launch Commit Criteria (LCC) for STS-111
 - Reduced FEP recovery procedure by 1.5 minutes
 - Deleting a checkpoint copy of the active FEP tables to Master console
 - Implementation of pre-planned FEP recovery procedure:
 - L-14 minutes for short launch windows
 - T-5 minutes for long launch windows
 - Present LCC is T-9 minutes
 - Clarify LCC notes (exceeding redlines)

**IN-FLIGHT ANOMALY
STS-110 RF FEP DATA
INTERRUPTION (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Risk Assessment
 - No effect to Flight Crew's safety
 - Earlier implementation of the LPS FEP redundancy requirement (L-14 minutes)
 - Hard-line FEP source is very reliable
 - FEP recovery procedure enhancements will improve on-time launch capability

**IN-FLIGHT ANOMALY
MLP3 HYDROGEN (H2) VENT LINE
FAILURE**

Presenter:

Brad McCain

Organization/Date:

Ground Ops/05-16-02

- Observation
 - Hydrogen (H2) leak from MLP3 H2 Vent Line during OV-104 STS-110 ET Cryogenic Loading

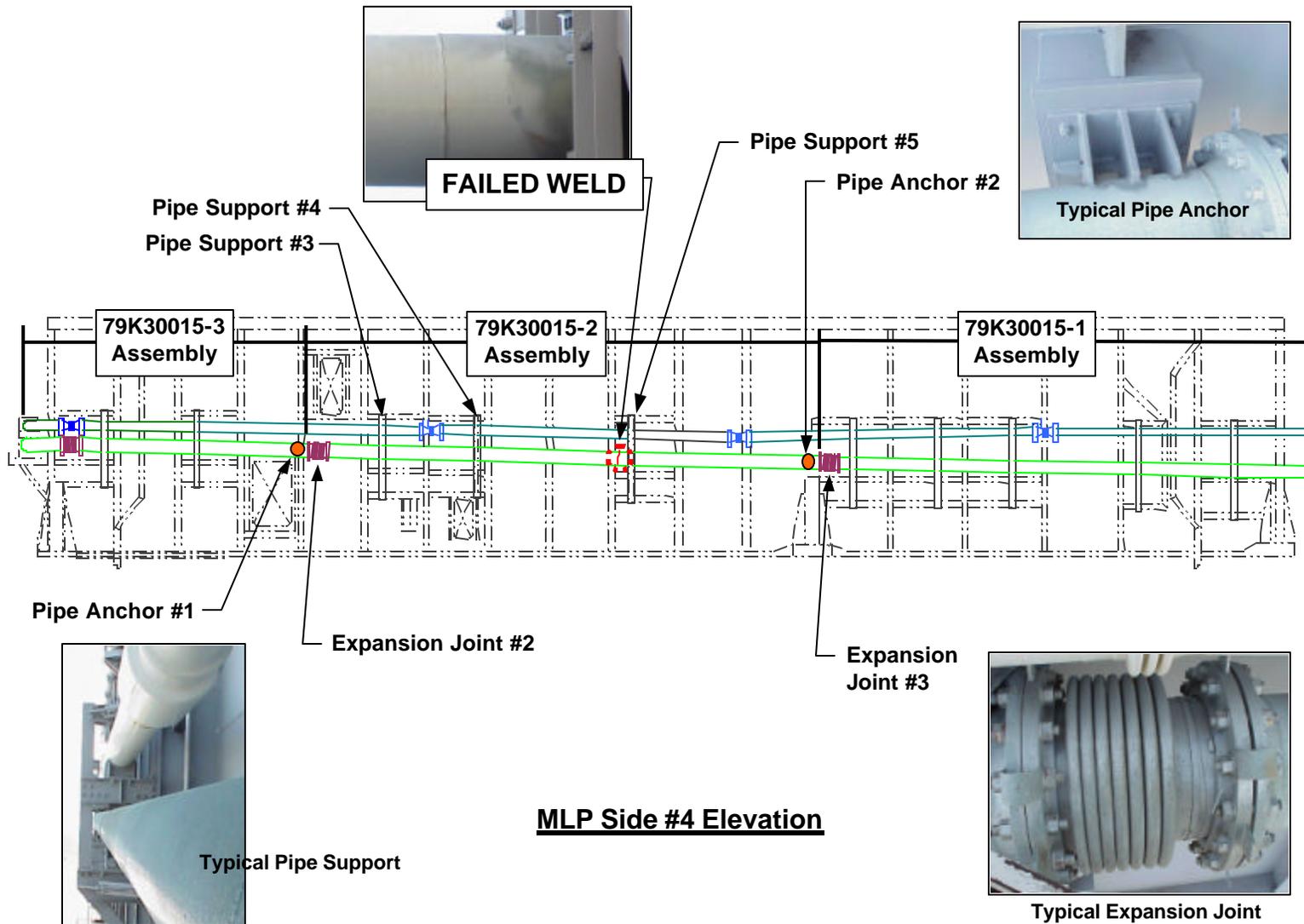
- Concern
 - Possible weld failure on MLP1 H2 Vent system

- Background
 - Leak attributed to cracked weld on MLP3 Hydrogen Vent line
 - Repair Clamshell was installed around failed weld
 - Supported successful ET H2 load and STS-110 launch

IN-FLIGHT ANOMALY MLP3 HYDROGEN VENT LINE FAILURE (CONT'D)	Presenter: Brad McCain
	Organization/Date: Ground Ops/05-16-02

- Discussion
 - MLP Hydrogen vent line characteristics
 - Double wall aluminum piping
 - Slotted spacers between Inner and Outer line provide a Hydrogen gas blanket for thermal insulation
 - Cryogenic fill and internal MLP lines are Stainless steel vacuum jacketed
 - MLP1 is supporting STS-111 launch operations
 - All three MLP's utilize Apollo era components to fabricate H2 vent lines
 - Approximately twice the cryogenic loads than MLP3
 - MLP3 had 46 cryo loads and 26 launches
 - MLP1 has 84 cryo loads and 44 launches

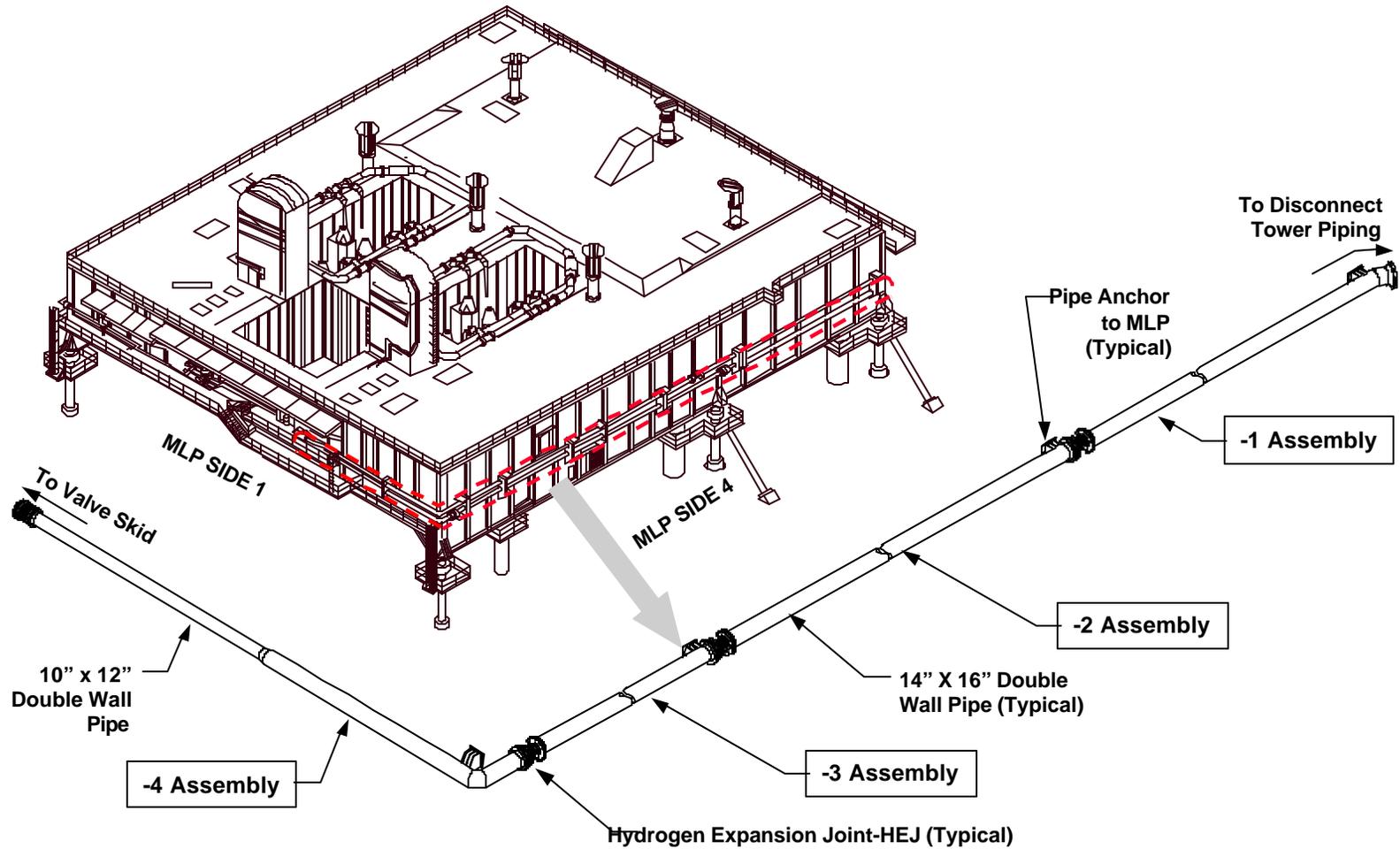
WELD CRACK ORIENTATION DIAGRAM



MLP H2 DOUBLE WALL VENT LINE ASSEMBLIES

Presenter:
Brad McCain

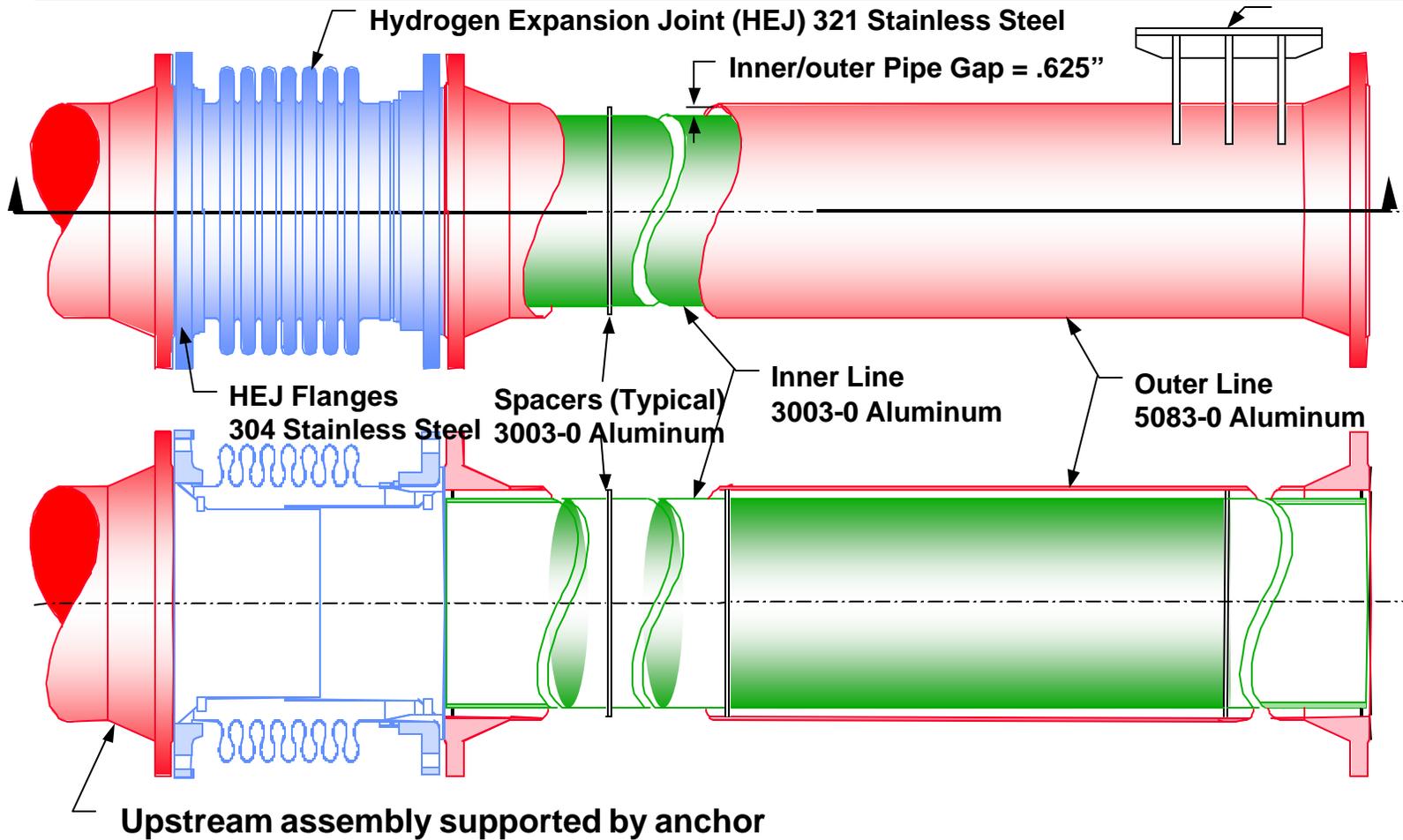
Organization/Date:
Ground Ops/05-16-02



MLP TYPICAL H2 VENT LINE ASSEMBLY

Presenter:
Brad McCain

Organization/Date:
Ground Ops/05-16-02



IN-FLIGHT ANOMALY MLP3 HYDROGEN VENT LINE FAILURE (CONT'D)	Presenter: Brad McCain
	Organization/Date: Ground Ops/05-16-02

- MLP-3 Actions Taken (STS-110 Post Launch)
 - Team implemented Fault Tree Analysis of weld failure
 - 48 items addressed will be presented at June 6th noon board
 - Repaired clamshell and cracked weld removed for lab analysis
 - Lab's preliminary results and conclusions
 - Line failed in tensile overloading originating at bottom of weld
 - Failure likely result of a single overload event
 - No evidence of fatigue or stress corrosion
 - Improper filler metal (4043) used to weld aluminum alloy (5083) – Very poor weld
 - Excessive amounts Magnesium Silicide (Mg_2Si) in weld structure
 - Decreasing ductility and increasing crack sensitivity
 - Significant areas of incomplete penetration, excessive melt-thru, porosity and lack of fusion were observed
 - Tests of intact failed weld section (3 specimens) showed ultimate tensile stresses of 31.7 ksi, 21.7 ksi and 8.9 ksi (Proper welded connection 40 – 45 ksi ultimate)

IN-FLIGHT ANOMALY MLP3 HYDROGEN VENT LINE FAILURE (CONT'D)	Presenter: Brad McCain
	Organization/Date: Ground Ops/05-16-02

- MLP-3 Actions Taken (STS-110 Post Launch) (Cont'd)
 - Structural Loads Analysis
 - Highest stresses developed due to launch induced loads
 - Peak Stress (3 Sigma) – 11.9 ksi
 - Highest stresses located in area of failed weld
 - Field Testing
 - Side 4 Hydrogen Expansion Joint (HEJ) removed and tested, indicating no problems
 - Ultrasonic inspection performed on the MLP1 H2 vent line of similar configuration
 - Welds have significant number of flaws
 - Similar to the failed weld

IN-FLIGHT ANOMALY MLP3 HYDROGEN VENT LINE FAILURE (CONT'D)	Presenter: Brad McCain
	Organization/Date: Ground Ops/05-16-02

- MLP-3 Actions Taken (STS-110 Post Launch) (Cont'd)
 - Fracture Analysis
 - Fracture mechanics is not valid for these welds
 - Weld properties not known for incorrect filler material
 - Flaws exceed the size boundaries for the analysis
 - Most Probable Cause For Weld Failure
 - Launch-Induced loads propagating cracks and/or developing internal stresses
 - Incorrect filler metal 4043 used on 5083 aluminum
 - Very poor weld quality – type and number of flaws
 - Final failure resulting from the lower thermal stressing during tanking

IN-FLIGHT ANOMALY MLP3 HYDROGEN VENT LINE FAILURE (CONT'D)	Presenter: Brad McCain
	Organization/Date: Ground Ops/05-16-02

- Certification of MLP1 H2 Vent Lines for Launch
 - Visual inspection of H2 vent lines completed
 - No discrepancies with vent line and structural supports
 - All 60 welds passed helium detection leak checks
 - Ultrasonic imaging completed on 36 welds of the 5083 configuration
 - Screening Criteria for H2 vent line welds complete
 - Identified 5 welds having a 3 sigma stress of 9 ksi or greater (minimum failure value of tensile test coupons)
 - Chemically etch and determine 2 of the 5 welds used the improper 4043 filler material on the 5083 pipe
 - Stress loads for the 2 welds with 4043 filler material are being re-evaluated to account for the structural supports unique to MLP-1
 - A leak check and cold shock will be performed on any new reinforced weld

IN-FLIGHT ANOMALY MLP3 HYDROGEN VENT LINE FAILURE (CONT'D)	Presenter: Brad McCain
	Organization/Date: Ground Ops/05-16-02

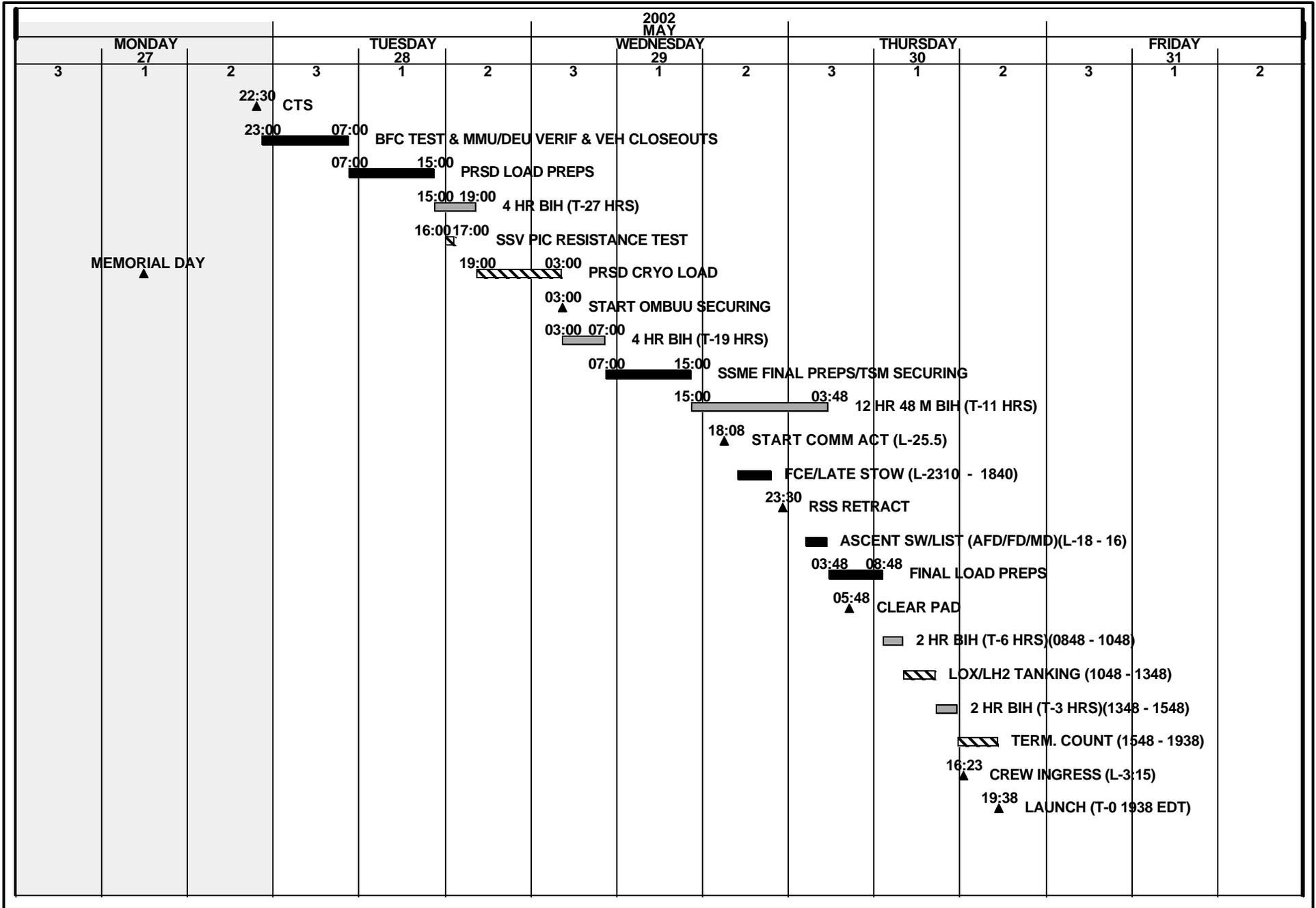
- Tanking Rationale
 - Number and type of flaws are acceptable based on :
 - Predicted (3 sigma) stresses below 9 ksi for incorrect filler metal
 - Use of correct filler metal
 - Welds that exceed 9 ksi and have incorrect filler metal will be reinforced
 - Double Wall Line is only used on external vent lines
 - Line can be secured by closing upstream valve
 - Standard Emergency Safing Procedures
 - All Vent Lines have purge capabilities for inerting/safing
 - Dedicated console operator performs continuous OTV scans during loading (facilitate immediate safing)
 - Line/supports inspected annually and proof tested to 18 psi before use
 - Risk Assessment
 - No risk to Flight and Crew's safety
-

STS-111 / OV-105

Launch Countdown Summary

OPR: S. Altemus (1-9302)

10MAY02 11:48



LAUNCH COUNTDOWN TURNAROUND OPTIONS

Presenter:

Steve Altemus

Organization/Date:

Launch & Landing/05-13-02

- PRSD Hold Time
 - ❖ LH2 – 2 Days Hold Time
 - ❖ LO2 – 2 Days Hold Time

- Payload Constraints
 - ❖ MPLM hold limit 6/13 – Based on 14 day requirement to refurbish the ADVASC GC and the MEP samples inside the MPLM

- Range Availability
 - ❖ No near term Range constraints

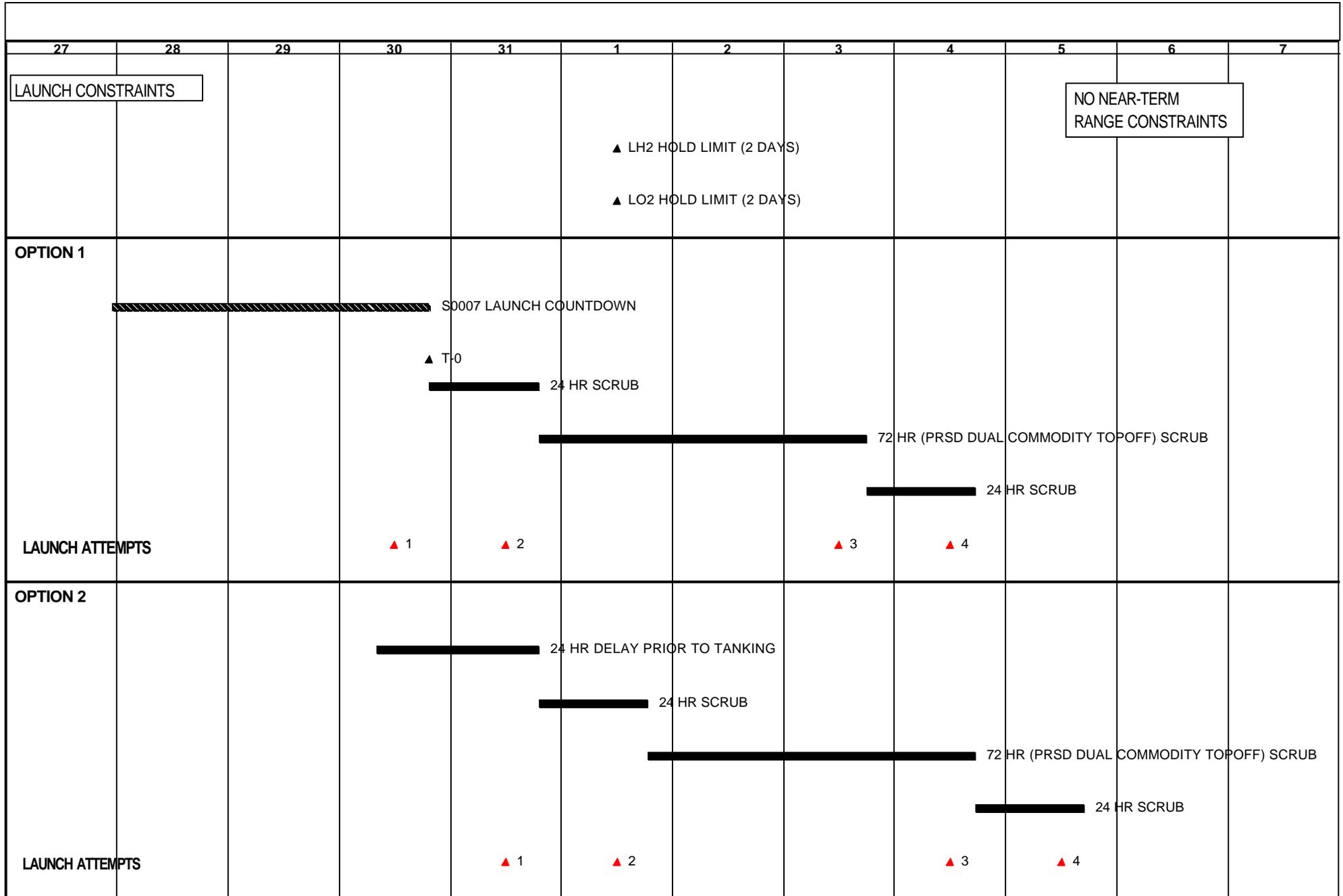


NOTE:
Actual scrub turnaround timelines will be determined
realtime based on specific conditions encountered.

STS-111

LAUNCH COUNTDOWN TURNAROUND OPTIONS

OPR: S. Altemus 1-9302
14MAY02 12:20



LANDING OPERATIONS STATUS

Presenter:

Steve Altemus

Organization/Date:

Launch & Landing/05-13-02

- **Launch Support**
 - ❖ **RTLS:** KSC
 - ❖ **TAL:**
 - Zaragoza (Prime) Deploy L-7, May 24, 2002
 - Moron (Alt) Deploy L-7, May 24, 2002
 - Ben Guerir (Alt) Deploy L-8, May 23, 2002
 - ❖ **AOA:**
 - KSC (Prime)
 - WSSH (Alt) Deploy at L-2 days, May 28, 2002
- **Mission Support**
 - ❖ KSC (Prime EOM)
 - ❖ DFRC/EDW Deploy at L-2 days, May 28, 2002
 - ❖ WSSH
- **Site Status**





Kennedy Space Center Shuttle Processing Team



STS-111 Readiness Statement

This is to certify that appropriate CoFR items from NSTS-08117 Appendices H and Q, Flight Preparation Process Plan, have been reviewed and dispositioned. Subject to completion of planned work and resolution of any identified constraints, KSC Shuttle Processing and Supporting Organizations are ready to support Launch Operations.

S/C. Fontana for

Charlie W. Murphy
APM, Integrated Logistics,
USA.

S/Andrew A. Allen

Andrew A. Allen
APM, Ground Operations,
USA.

S/David A. King

David A. King
Director of Shuttle Processing,
NASA



STS-111
FLIGHT READINESS REVIEW
BACK-UP

May 16, 2002

Ground Operations

LOST ITEM PROBLEM REPORTS

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02

Lost Items Not Found – (1 Total)

Summary/Conclusion for all LAF PR's

- A thorough search of each area was unsuccessful in finding/retrieving the lost items
- System Engineering evaluations have concluded no adverse effect on Orbiter system operations

FORWARD

- PR LAF-FRCS5-18-0004 Missing Highlock Nut
 - Weight: 38 grams
 - Size: 0.25 x 0.25 x 0.281
 - Location: FRCS Thruster Can F3D

FUEL CELL RUNTIME

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02

- Fuel Cell (FC) Runtime Contingency
 - Present Runtime Hours
 - FC1 s/n 109 677
 - FC2 s/n 116 674
 - FC3 s/n 115 0
 - Planned Runtime Usage - 366 hours
 - 11 + 1 day mission + 2 weather contingency days + 30 hours FC start/landing
 - Available Contingency Runtime
 - FC1 1557 hours
 - FC2 1560 hours
 - FC3 2234 hours

GROUND LAUNCH SEQUENCER	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

- Ground Launch Sequencer Configuration for STS-108
- GLSDD (KLO-82-0071A) Rev 9, Change A, March 2002

- **Mask**
 - ECL-40 FC1&2 Payload Heat Exchanger Flow Rate
 - CT-01 TACAN 1 Range Built-in Status Word 2 Bit 4
 - CT-01 TACAN 2 Range Built-in Status Word 2 Bit 4
(TACAN 1 is Gould, TACAN 2 and 3 are Collins)
 - PAY-02 Payload Auxiliary RPC A & B - ON
 - PAY-03 Payload Aft Main B & C Power – ON

- **Bypass**
 - SSME-02 SSME#3 is Block II

UNEXPLAINED ANOMALIES GALLEY POTABLE WATER FLOW RATES DEGRADED

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02

- Observation
 - Galley flowrates from the hot and cold needles degraded during 8 ounce dispenses (allowable is 210 to 251 mL)
 - Cold dispense quantities – 220, 210, **180, 80** mL
 - Hot dispense quantities – **110,110, 60** mL
 - Auxiliary H2O port experienced degraded flow
 - Provides water for personal hygiene
 - Problem occurred October 10, 2001 STS-108
- Concerns
 - Affect In-Flight drink and bag fill operations
 - Use of alternate water collection points if dispense function failed

UNEXPLAINED ANOMALIES GALLEY POTABLE WATER FLOW RATES DEGRADED (CONT'D)

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02

- Discussion
 - 2 prior occurrences of degraded flow rate through Galley
 - STS-27 OV-103 S0007
 - Plastic bag material found in Galley supply valve
 - STS-82 OV-103
 - Cotton found in Galley supply valve
 - Galley connected to Orbiter via 2 QD's at Middeck floor
 - Water is supplied from Potable Tank A
 - Galley provides hot or cold water via the dispense needle
 - Control Electronic Assembly (CEA)
 - Utilized for control of dispenses
 - Selected quantities of 0.5 to 8.5 ounces available

**UNEXPLAINED ANOMALIES
GALLEY POTABLE WATER FLOW
RATES DEGRADED (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Actions Taken
 - Multiple Galley dispenses performed with some degradation still present
 - Demated Galled QD and Orbiter flow was acceptable
 - Additional dispenses performed nominal
 - Topped off Orbiter Tank A
 - Compressibility checks indicate no presence of free gas
 - Subsequent ground system flushes and testing failed to identify or recreate flow anomaly
 - Crew reported all dispenses during STS-108 mission were nominal

UNEXPLAINED ANOMALIES GALLEY POTABLE WATER FLOW RATES DEGRADED (CONT'D)

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02

- Possible Causes
 - Free air could cause intermittent flow reduction by affecting water pump performance
 - Orbiter system was evacuated and backfilled with water
 - Required vacuum of 25 mmHg was not obtained (actual 44 mmHg)
 - Post evaluation discovered air leak on GSE jumper assembly
 - Flow restriction/contamination could degrade flow
 - Both hot and cold Galley needle dispense flowrates affected
 - Common source is on Orbiter side between Tank A and Galley Supply valve tee
 - No intrusive work performed on Orbiter water system
 - Galley hot water tank replaced

**UNEXPLAINED ANOMALIES
GALLEY POTABLE WATER FLOW
RATES DEGRADED (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Most Probable Cause
 - Free air in the system

- Flight Rationale
 - System redundancy not affected
 - Total failure of Galley dispense function required potable water obtained from alternate source
 - Galley test port, Aux port, Interface or crossover QD's

- Risk Assessment
 - No risk to Flight and Crew's safety or Mission success

**UNEXPLAINED ANOMALIES
H2 CONCENTRATION
DETECTED IN MIDBODY****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Observation
 - Hydrogen (H₂) concentration of 15 PPM detected from Orbiter Midbody purge during STS-108 Launch operations
 - Observed on Hazardous Gas Detection system (HGDS) independent primary and backup systems
 - Hydrogen elevated for 4 minutes then returned to baseline
 - H₂ indication coincident with Power Reactant and Storage Distribution (PRSD) Hydrogen tank vent down
 - Calculated H₂ leakage to be within 33 to 70 scim (depending on leak source location)
- Concerns
 - Integrity of PRSD Hydrogen system

**UNEXPLAINED ANOMALIES
H2 CONCENTRATION
DETECTED IN MIDBODY (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Discussion
 - PRSD H2 tanks required top-off due to STS-108 Launch scrub
 - Opened all 5 PRSD H2 tanks ground disconnects and depressurized through the ET H2 vent stack
 - Rapid chilldown causes thermal shock to PRSD H2 vent system
 - Approximately 40 to 50 pounds of liquid Hydrogen vented
 - First PRSD H2 tank toptoff for OV-105
 - No PRSD H2 hardware changes for STS-108 processing
 - HGDS samples Midbody purge from two 1307 Aft bulkhead purge paths

**UNEXPLAINED ANOMALIES
H2 CONCENTRATION
DETECTED IN MIDBODY (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- **Actions Taken**
 - Post H2 Cryo load data reviewed
 - No further indication of H2 for STS-108 cryo toff and launch
 - Post mission troubleshooting unable to isolate leak
 - Visual inspections of PRSD H2 Vent system and insulation
 - Mass Spec all exposed H2 Vent fittings
 - No intrusive foam removal was performed
 - Long term 48 day decay was 1.68 sccm (in-family)
 - Pre-launch leak at ambient calculated to at least 18 sccm
- **Actions Planned**
 - Next OV-105 PRSD H2 toff (contingency)
 - Vent each H2 tank individually to isolate leak source

**UNEXPLAINED ANOMALIES
H2 CONCENTRATION
DETECTED IN MIDBODY (CONT'D)****Presenter:****Chris Connolly****Organization/Date:****Ground Ops/05-16-02**

- Possible Causes
 - Momentary leakage in PRSD H2 vent system
 - PRSD H2 vent system would have a pre-existing leak path
 - Rapid chilldown from PRSD H2 venting induced thermal stresses/liquid leakage
 - Leakage stop/reduced when thermal stabilization achieved
 - Leak would be undetectable during normal conditions
 - External H2 intrusion into the Midbody
 - Concentrated H2 vented from unlit ET Flare stack
 - Wind direction could migrate an H2 cloud around Orbiter
 - External H2 intrusion into the Orbiter and /or leak path in HGDS sample lines would be detectable
- Most Probable Cause
 - Momentary leakage in PRSD H2 vent system
 - Leak path too small to detect under normal conditions
 - Momentary leakage attributed to thermal stresses /increased fluid density during PRSD H2 tank venting

UNEXPLAINED ANOMALIES H2 CONCENTRATION DETECTED IN MIDBODY (CONT'D)	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

- Risk Assessment
 - No risk to Flight and Crew's safety or Mission success
- Flight Rationale
 - PRSD H2 system met all required integrity checks
 - All H2 Fittings are safety wired
 - H2 leakage was momentary and not seen during remainder of STS-108 cryo load and Launch
 - No PRSD in-flight anomalies during STS-108 mission
 - Observed leakage of 0.01 lb/hr is magnitude less than flight rule allowance – 1 lb/hr entry, 5.5 lb/hr for post landing

ENGINEERING TOPIC MLP HEAT SHIELD RETAINER BARS	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

- Observation
 - MLP-3 Heat Shield retainer bar found in flame trench during STS-110 post-launch inspections
- Concerns
 - Launch debris impacting Shuttle Flight hardware
- Discussion
 - Retainer bar attaches between MLP heat shields
 - Each retainer bar fastened using ½ inch diameter roll pins (total of six pins)

ENGINEERING TOPIC MLP HEAT SHIELD RETAINER BARS (CONT'D)	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

- Actions Taken
 - STS-110 MLP-3 Post launch inspections
 - Retainer bar that separated from MLP3
 - Top 2 roll pins were missing
 - Never installed when built (no hole witness marks)
 - Corrosion observed on remaining 4 roll pins
 - Corroded from inside to outside
 - Enhanced Heat Shield Roll pin Inspections for STS-111
 - Remove screed covering roll pins removed
 - Verify no obstructions (corrosion, etc)
 - Utilize dental pic along ID of roll pins

ENGINEERING TOPIC
MLP HEAT SHIELD RETAINER BARS
(CONT'D)

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02



G0-BU-17

**ENGINEERING TOPIC
MLP HEAT SHIELD RETAINER BARS
(CONT'D)**

Presenter:

Chris Connolly

Organization/Date:

Ground Ops/05-16-02



ENGINEERING TOPIC MLP HEAT SHIELD RETAINER BARS (CONT'D)	Presenter: Chris Connolly
	Organization/Date: Ground Ops/05-16-02

- Flight Rationale
 - Enhanced inspections verify roll bar pin installation integrity

- Risk Assessment
 - No Risk to Flight and Crew's safety